APPENDIX B
ECOLOGICAL, SOCIAL, AND ECONOMIC CONSIDERATIONS
George Washington and Jefferson National Forests
Travel Analysis Process

Ecosystem Functions and Processes (EF)

EF 1: What ecological attributes, particularly those unique to the region, would be affected by roading of currently unroaded areas?

Road construction in currently unroaded areas could facilitate the movement of non-native invasive species, particularly non-native invasive plants, into areas where they do not currently occur (See EF2). Road construction could potentially increase the sediment load to streams. Road construction can fragment habitat for some species, but this effect is considered minor for most species on the Forests, particularly for the low maintenance level roads primarily constructed for management activities. Road construction could allow additional restoration activities, such as creation of grasslands, shrublands, open woodlands and regenerating forests which are not currently at the levels desired in many ecological systems on the Forests.

EF 2: To what degree do the presence, type, and location of roads increase the introduction and spread of exotic plant and animal species, insects, diseases, and parasites? What are the potential effects of such introductions to plant and animal species and ecosystem function in the area?

The road system can be a main contributor to the establishment and spread of non-native invasive plants. Some species are brought in with fill material, planted for erosion control, or brought in with forest visitors using the roads. Other species are spread with the movement of forest visitors from one location to another and by road maintenance operations such as grading and mowing. Once established, some species are persistent and spread rapidly out into the surrounding landscape and replace native plants and associated insects. These invasives may displace the habitat of existing native species. Ecosystem function can be dramatically altered by the introduction and spread of invasives and our road systems may provide a major opportunity for introduction of new species from other states, areas, or nearby infestations.

Potential effects can be reduced through management activities. The use of Category 1 Species is prohibited. The establishment or encouragement of Category 2 Species is prohibited in areas where ecological conditions would favor invasiveness and is discouraged elsewhere. Projects that use Category 2 Species should document why no other (non-invasive) species will serve the purpose and need. A contractor's sources of fill, soil, shale, and related materials will be pre-approved. Contractors will submit a description of the source. The project inspector or a qualified designee will inspect the supply source. Use of the source will be prohibited if contaminated by transferable agents of invasive species. Forest sources of fill, borrow or road surfacing material will be examined for NNIP and treated as necessary to prevent transfer of invasive plants to other parts of the Forest. Mechanical equipment, such as that used for logging, mowing, fire fighting and earth moving (including road graders), should be free of soil, seeds, and other attached material prior to coming on the Forest or being moved from areas on the Forest with NNIP infestations to areas free from noticeable infestations. Such equipment should be examined by qualified Forest Service personnel before allowed on the Forest.

EF 3: To what degree do the presence, type, and location of roads contribute to the control of insects, diseases, and parasites?

The main situation where roads can contribute to the control of insects and diseases is with southern pine

beetles. Treatment of outbreaks of southern pine beetles needs to be done quickly, so often the only areas where treatment can be done is in areas that already have road access.

EF 4: How does the road system affect ecological disturbance regimes in the area?

Roads allow access for timber management that can mimic disturbance regimes that create openings and regenerating forests. Roads also provide access for prescribed burning and wildfire control. They provide fuel breaks to manage fires.

Road access increases risk for human-caused fires on the Forest by dispersing people. Roads also allow rapid response opportunities for fire suppression. Even though it is acknowledged that road access in the Forest increases risk for human caused fire, this risk can be minimized through administrative means such as smoking and campfire restrictions and complete closures during high and extreme fire danger periods. Forest Service gates may be used to restrict public access while allowing for suppression-resource access.

EF 5: What are the adverse effects of noise caused by developing, using, and maintaining roads?

Given the interspersed nature of private lands and National Forest System lands and current extent of Forest Service and state roads, it is very difficult to escape the noise of roads on this Forest. This is not considered to be an important issue for transportation analysis.

Aquatic, Riparian Zone and Water Quality (AQ)

AQ 1: How and where does the road system modify the surface and subsurface hydrology of the area?

The roads have three primary effects on hydrologic processes. They intercept rainfall directly on the road surface and cut banks, and intercept subsurface water moving down the hillslope; they concentrate flow, either on the surface or in an adjacent ditch or channel; and they modify water flow from paths that it would otherwise take if the road were not present. Roads can affect peak streamflows depending upon the size of the watershed involved. As a general rule, however, roads extend the drainage network of a watershed and result in quicker flood peaks. In the GWNF, roads constitute a small proportion of the land surface and have relatively insignificant effects on peak flow. Roads do not appear to alter annual water yields within the watershed.

It is likely that all roads on the Forest modify surface hydrology to some degree due to the nature of the road prism on the landscape. The loss of vegetation, compaction of the soil, and modification of the slope all contribute to changes in surface hydrology. These affects are mitigated to various degrees by the design of the road and condition of the road surface. For example, an insloped road would divert surface runoff to the inside of the road where it is concentrated for a given distance until it is diverted off the road prism, where an outsloped road would shed water off the road surface along its length. Condition of the road surface is notable as well since a well-vegetated road surface will typically shed water at a slower rate than a road without a vegetative cover due to increased roughness associated with vegetation.

The type of crossing structure where a road crosses a stream can affect the hydrology. Undersized culverts can restrict high flows resulting in the loss of the culvert and fill material or in the movement of the stream channel to a new location.

AQ 2: How and where does the road system generate surface erosion?

By their nature, all native or aggregate surfaced roads will generate some surface erosion. The amount

depends on factors such as soil type, road surface type, road gradient, road prism, the spacing and effectiveness of drainage structures, traffic use, and maintenance activity. The extent of surface erosion occurring on road cutbanks depends on the steepness, slope length, soil type, and vegetative cover. Road ditches concentrate water flow which generates surface erosion and also increase sediment delivery to streams from road surfaces and road cutbanks. Ditches and culverts that are blocked create surface erosion issues by diverting water flow onto road surfaces.

Native surfaced roads often referred to as unsurfaced roads, generally have the most roadbed erosion because there is no surface to protect the soil particles from rain impact. Commercial gravel surfacing provides a good level of protection to the road surface from rain impact and moderate vehicle traffic. Generally, the addition of gravel, increases the porosity and increases the hydraulic conductivity of the road, which decreases the runoff and associated erosion (Flerchinger and Watts 1987). Gravel also reduces the formation of ruts and reduces water flow path within the roadbed (Foltz and Truebe 1995). Overall properly sized and applied gravel has been shown to result in reductions in erosion of 79 to 97% over unprotected, unsurfaced roadbeds (Swift 1984; Burroughs et al., 1985; Kochenderfer and Helvey 1987). Paved roads rarely experience any erosion of the roadbed, but often direct high amounts of water off the road so that there is more erosion adjacent to the road.

The more erodable a soil is the more the roadbed will benefit from gravel for reducing erosion. The level of erosion reduction from gravel also depends on the size applied, the amount applied, and the erodability of the soil or other material the road is built on. Larger average size of gravel applied to the road will generally result in lower erosion rates, as will greater depths of gravel applied (Swift 1984). It is important to note that while helping to further reduce erosion, larger gravel is more expensive and can cause safety hazards for drivers.

Roadbed erosion primarily occurs through rainsplash movement and sheet erosion just as on exposed soils. Roadbeds erode more readily than typical exposed soils because they have lost soil structure due to extreme compaction (Froelich 1975). Rilling and gullying are also common erosion processes on roadbeds (Novotny and Olem 1994). Traffic volume on a given road, especially those with native and gravel surfacing, can increase the erosion from the roadbed (Reid and Dunne 1984; Sullivan and Duncan1981). Often heavy traffic volume is an indication to increase the durability of the road surface to limestone or pavement. Another solution to the issue of high traffic volume is to restrict traffic by closing or restricting travel on the road. The times for restriction are typically in the spring to avoid periods when roads and trails are on saturated soils that are susceptible to damage.

The steeper the grade of the road the greater the erosion potential from the roadbed (Elliot and Tysdal 1999). The steeper the slope perpendicular to the road the greater the fill slope erosion potential and potential erosion of adjacent areas from excess water draining off the road (Burroughs and King 1989; Soil Survey Staff 1999). Erosion of the fill slope can create unstable conditions in the roadbed or even gullies that extend into the roadbed. Back slope erosion is also greater on steeper slopes perpendicular to the road as runoff from land above the road or from subsurface flow intercepted by the road cut increases velocity on the often-exposed back slope soil. Runoff in the drainage ditch can also cause accelerated erosion if it is allowed to concentrate for great lengths (Burroughs and King 1989). Typically this erosion will occur in the drainage ditch itself, but it may extend into the roadbed or onto the fill slope and land down slope where the drainage ditch runoff is deposited (King 1979; Burroughs and King 1989).

Road maintenance involving ditching and crowning of the road can cause short-term increases in roadbed and drainage ditch erosion as the armored, and sometimes vegetated, surface is displaced. A vegetated drainage ditch has been observed to produce only about 10-20% as much sediment as a freshly graded drainage ditch (Luce and Black 1999). Road construction produces the same high increase in short-term erosion as road maintenance, but also adds new long-term chronic increased levels of erosion (Megahan

and Kidd 1972). The wider a newly constructed or maintained road is the more effect it will have on runoff and in turn potential soil erosion.

Even though road maintenance can cause short-term increases in erosion and sedimentation it will typically reduce erosion in the long-term. Road maintenance can range from simple grading to ditching and crowning to adding gravel surface to improving road drainage to stabilizing back and fill slopes. Grading, while bringing up highly erodable fine soil material, can remove ruts, which if left alone would create long flow paths for carrying water that could erode and transport sediment for long distances (Elliot 2000). Ditching and crowning is a form of grading that also pulls sediment out of the drainage ditch along with any vegetation or armoring and incorporates it back into the roadbed. Adding gravel will also reduce rutting and reduce rainsplash erosion of the roadbed (Foltz and Truebe 1995). Gravel also allows a road to hold up better under heavy traffic volumes with less maintenance. Improved drainage will help to avoid concentrated water creating gullies on steep slopes (Weaver et al., 1995; Wemple et al., 1996) and place water in proper locations to avoid increasing the hazard of mass wasting (see AQ3). Drainage of the road can also help to deposit sediment-laden runoff onto low gradient, well vegetated areas where the sediment can settle out before reaching the stream. Back and fill slopes stabilized with rip-rap, slash windrows, geotextiles, erosion mats, straw, etc. are more resistant to erosion and mass wasting (Burroughs and King 1989).
The beneficial effects of road maintenance discussed above are based on the assumption that the road is receiving some level of use. If a road is completely closed off to use it will usually stabilize on its own over time, but it can continue to be a chronic source of increased sediment (Elliot et al., 1996). Often stabilization of sediment inputs can take several decades so decommissioning, which will cause a short-term increase in erosion, is preferred. Decommissioning also has other benefits such as improved hydrological function, restored landform, improved slope stability, and reduced compaction. The decision to allow a closed road to stabilize over time or to decommission it must be site specific as a closed road can be a chronic source of sediment if left alone but sometimes decommissioning a road can create more erosion and sedimentation than it will save (Elliot et al., 1996; Elliot 2000).

AQ 3: How and where does the road system affect mass wasting?

While mass wasting can be a problem on the GWNF it is most often a natural landslide process related to excessive rainfall and can occur across the landscape. However, in some situations roads can trigger mass wasting.

Excavation for road construction on a steep slope can undercut and remove some support from the hillside. In some geologic settings (adverse bedrock structures or weak surficial materials), this undercut and removal of support may lead to failure of the road cut-slope. Or, construction of a road fill or log landing fill on a steep slope may lead to a failure of the fill-slope. Slope failures of road cut-slope or fill-slope occur occasionally, generally during intense rainstorms when natural landslides also occur. A geologic hazard related to management activities of special concern are debris flows caused by failure of fill slopes. Destructive debris flows that can sweep hundreds or thousands of feet down slope can be caused not only by failure of natural slopes but also by failure of fill slopes (roads, log landings). On the National Forests of North Carolina in September 2004 Hurricanes Frances and Ivan triggered many road fill failures on Forest Service roads as well as on the Blue Ridge Parkway that resulted in debris flows gouging destructive paths long distances, endangering people and damaging infrastructure (Collins, T.K., 2008). Road fills (or log landings fills) on steep slopes may be marginally stable, but vulnerable to failure during intense rainstorms. As demonstrated in September 2004, road fills on a steep slope high on a mountain are a special concern because of the snowball effect as the fill failure transforms to a debris flow and bulldozes the soil, weathered rock, and trees into a larger destructive mass as it gouges down the mountainside. Such debris flows caused by fill failures can travel a mile or two down slope just like

debris flows caused by natural slope failures, endangering people and infrastructure down slope and in the valleys.

AQ: 4 How and where do road-stream crossings influence local stream channels and water quality?

All road-stream crossings have the potential to influence stream channels and water quality. These crossings represent direct interaction of roads and streams and serve as a primary conduit for road-related erosion and storm drainage to reach streams. Road-stream crossings can physically change the alignment of stream channels for short distances. Long-term contributions of sediment into streams can result in geomorphic changes to channel alignment and substrate condition. Increases in storm runoff associated with roads can also result in channel alignment and substrate changes such as downcutting.

In most cases culverts have more of an influence on stream channels and water quality than do bridges or bottomless culverts. A culvert can modify flow energy as streamflow moves from the channel to the pipe and into the channel again. Streamflow at a culvert that is too small to effectively pass flow produced by a runoff event or that becomes plugged by debris or sediment can exceed the culverts inlet capacity and result in overtopping of the inlet and thus a rise in water level on the fillslope. When doing so, the risk of fillslope failure and flow diversion out of the channel increases, as does the potential for erosion and sedimentation. When road crossings overtop and the crossing does not allow water to pass over the road fill and back into the channel below the crossing, flow can be diverted away from the crossing and down the road ditch or running surface. Thus, erosion can occur on the road prism and/or downslope of the road as it leaves the road. If this diverted flow were to travel down to a neighboring stream crossing then additional adverse impacts could occur at the crossing and in the receiving stream channel.

Stream crossings without a bridge or culvert such as ford crossings can allow greater sediment delivery to streams because of the direct connection from a road to a stream as compared to culvert crossings or bridges. However, fords with solid substrate in wide channels can also reduce the amount of fill brought in to cover a culvert, or provide support to bridge abutments.

AQ 5: How and where does the road system create potential for pollutants, such as chemical spills, oils, deicing salts, or herbicides, to enter surface waters?

Forest Service roads generally have a low potential for pollutants to enter surface waters. However, many state roads traverse the GWNF and the use of deicing salts and the use of these roads by vehicles hauling materials that could cause pollution have a greater potential for problems.

AQ 6: How and where is the road system "hydrologically connected" to the stream system? How do the connections affect water quality and quantity?

The road system is connected to streams at stream crossings, roadside ditches that empty directly into streams, drainage turnouts, and at some locations, by road surfaces that lie adjacent to streams and direct runoff and sediment from roadbed/fill surfaces to streams. Stream crossings and insloped roads with drainage ditches are the principle means of hydrologic connectivity within the analysis area. The primary consideration (on national forest lands) of hydrologic connectivity on water quality is the input and transport of sediment (See AQ (1) and AQ (4)

Some roads on the Forest existed before the lands became part of the National Forest System. Often these roads are located in the valley bottoms and have frequent crossings of the streams. These roads are the most hydrologically connected on the Forest.

AQ 7 What downstream beneficial uses of water exist in the area? What changes in uses and demand

are expected over time? How are they affected or put at risk by road-derived pollutants?

Downstream beneficial uses of water on the GWNF include: drinking water for over 30 communities, habitat for the endangered James spinymussel, habitat for native brook trout, habitat for other sensitive aquatic species, fishing, and swimming.

AQ 8: How and where does the road system affect wetlands?

There are no known locations where the road system is affecting wetland conditions or function.

AQ 9: How does the road system alter physical channel dynamics, including isolation of floodplains, constraints on channel migration, and the movement of large wood, fine organic matter, and sediment?

The road system can alter physical channel dynamics by increasing runoff and sediment delivery to affected streams. Sediment entering streams can reduce pool depths and contribute to changes in channel substrate (i.e. embeddedness). Stream crossings can retard or prohibit the movement of large woody debris, fine organic matter and sediment. Areas located within the riparian corridor tend to isolate the floodplain associated with streams and impede or prevent natural channel migration.

"Stream channels are dynamic. They migrate within historic floodplains, eroding the bed and banks in one place while aggrading the bed and building new banks in other places. Streams also transport and deposit large pieces of woody debris and fine organic matter, and provide physical structure and diverse aquatic habitat to the stream channel. When roads encroach directly on stream channels, these processes can be modified. Wood and sediment can be trapped behind stream crossings, reducing downstream transport and increasing the risk of crossing failure. Road alignment and road fills can isolate floodplains, constrict the channel, constrict channel migration, and simplify riparian and aquatic habitat. In some places, road encroachment can divert streamflow to the opposite bank, thereby destabilizing the hillslope and resulting in increased landsliding." (USDA-FS 1999)

Road-stream crossings are locations where the movement of large wood, fine organic matter, and sediment are often modified. Fills within the floodplain typically characterize road-stream crossings and culverts that can constrict flood flows. During flood events when flows inundate the floodplain, a road crossing typically creates a "bottle neck" condition and a temporary impoundment as the water funnels through the culvert or bridge opening. During these situations, streamflow is slowed upstream of the crossing and the potential for deposition of entrained material increases, thereby reducing the likelihood of downstream transport. As a result, channel-forming processes can be altered.

AQ 10: How and where does the road system restrict the migration and movement of aquatic organisms? What aquatic species are affected and to what extent?

Fish, mussels, reptiles, and amphibians are susceptible to blockage at road crossings. Low water fords, bridge aprons, and culvert pipes may include artificial cascades or waterfalls that are beyond the jumping and swimming capabilities of many aquatic species. These drops may block movements primarily during low flows. The shallow laminate flows of aprons or the concentrated flow of culverts can impede aquatic organism movements at either low or high flows.

Road crossings and other artificial barriers may restrict fish access to prime habitat. Smaller stream fishes may not migrate across large distances, however, many species rely on seasonal upstream movements to access more suitable spawning habitat and to replenish populations that have declined due to natural or human caused disturbance. Since mussels rely on fish hosts during their early life history, mussels may

also be limited in their distribution due to artificial barriers. Young mussels attach themselves on to fish. In this way, mussel populations can re-populate upstream areas that could otherwise become devoid of mussels over years of downstream drift or periodic floods and drought. Amphibians and reptiles may also be affected by road crossings. Semi-aquatic species such as turtles and frogs may be forced to travel overland and across roadways where they are susceptible to predation and road kill. Even slow moving snails and salamanders can be affected since they may be attracted to the cobble cover and hardened substrates present at some low water fords. Their concentration at crossings can result in elevated road mortality and deplete local populations.

A comprehensive fish passage assessment has been completed for parts of the GWNF.

AQ 11: How does the road system affect shading, litterfall, and riparian plant communities?

Most of our roads are located outside of riparian areas and do not significantly alter shading of the riparian areas. Short stretches of riparian communities may have altered species composition due to increased sunlight from road crossings.

AQ 12: How and where does the road system contribute to fishing, poaching, or direct habitat loss for at-risk aquatic species?

The road system allows the public to access our streams and lakes for recreational opportunities. Habitat loss for aquatic species is most likely to come from passage barriers created by culverts and low water crossings and/or additional sedimentation caused by poor road maintenance or road location.

AQ 13: How and where does the road system facilitate the introduction of nonnative aquatic species?

Roads give the public access to our waters and they allow the possible introduction of aquatic NNIS into streams and lakes. However, the main NNIS of current concern is Didymo and its introduction is more closely related to the fishery (coldwater releases from impoundments) than to road access.

AQ 14: To what extent does the road system overlap with areas of exceptionally high aquatic diversity or productivity or areas containing rare or unique aquatic species or species of interest?

Many watersheds in the GWNF support high aquatic diversity. The road system is no more, nor no less in extent in the higher diversity watersheds.

Terrestrial Wildlife (TW)

TW 1: What are the direct effects of the road system on terrestrial species habitat?

The Forest road system and human use of those roads alters terrestrial species habitat. Direct effects include disruption of normal animal behavior and habitat use, isolation of small, low-mobility species populations, fragmentation of habitats, and increased parasitism, mortality and predation. Some potentially beneficial effects of roads include provision of exposed soil and gravel to birds to aide in digestion and dusting areas to aide birds in feather maintenance and parasite control, and improved brood rearing habitats along road edges through increased arthropod production. Such necessary habitat features are often limiting in forested habitats. Roadsides provide potential habitat for plant species that require early successional herbaceous habitats.

Roads may act as barriers to wildlife movement. The effectiveness of the road as a barrier is a function of the road width, traffic density, and mobility of the species. A forest road may be wide enough to increase

predation on individuals or to inhibit dispersal of individuals depending on width of cut-and-fill slopes and maintained right-of-ways. Fragmentation of a population leading to isolation of individuals and eventual loss of population viability could result from road construction through sensitive habitat.

Levels of human access within bear habitat determine the degree of negative effects on bears (Beringer 1986; Brody and Pelton 1989). Generally, high bear population densities are associated with areas of low open road density (SAMAB 1995:87). Low-traffic roads and trails are used by bears as travel ways and provide the benefit of additional edge and associated soft mast, whereas high traffic volumes have a negative impact (B. Fletcher, pers. comm.). Effects vary based the duration and time of year the road or trail is open for use and the number and type of recreation users present.

TW 2: How does the road system facilitate human activities that affect habitat?

Many species including whitetail deer, turkey, and others utilize early successional forest habitats frequently interspersed with mature forest. In these habitats the canopy is opened, the forest structure is frequently disturbed (often by fire), and herbaceous or shrub vegetation often proliferates. Public demand for hunting opportunity is high. Game species, many songbirds, and many showy and desired plants are benefited by management actions producing early successional conditions. Hunting, wildlife viewing, and other wildlife-based recreation are facilitated by access provided by roads, and many desirable wildlife species populations are increased by forest management practices that utilize road systems.

Roads, including the rights-of-way associated with them, are narrow corridors of early successional habitat through the Forest providing areas where populations of game species are enhanced. The road system provides access for forest management. Roads allow access to permanent openings managed as early successional herbaceous habitats. Additionally, roads may serve as firebreaks during prescribed burns. During wildfires, where one of the goals is to protect wildlife habitat, roads provide access for firefighters and firebreaks that limit the extent of damage.

Roads facilitate collection (both legal and illegal) of Forest products including timber, firewood, plants, and animals. Timber sale and firewood areas are designated by the Ranger Districts and are designed to have minimal adverse impacts on most wildlife species while providing improved habitat for many species.

TW 3: How does the road system affect legal and illegal human activities? What are the effects on wildlife species?

Forest road systems facilitate legal hunting, which is an important wildlife management tool. In addition, road access supports activities such as wildlife viewing and nature photography. Poaching (illegal take of wildlife) is closely associated with roads. Wildlife is often drawn to roadsides to feed on herbaceous plants, which may be limited to roadsides in areas of mature forest. This puts them at risk from poachers illegally shooting from roads. Increases in open road miles diminish the effectiveness of a fixed number of law enforcement officers, and increase poaching opportunities.

Roads allow people access to the Forest for illegal dumping, which can be dangerous to indigenous animals that might ingest it, and it may also attract nuisance wildlife (crows, rats, feral cats and dogs, nuisance bears, etc.).

Roads can serve as access points for illegal use of off-road vehicles, arson, and marijuana plots.

TW 4 How does the road system directly affect unique communities or special features in the area?

Because rare communities and special features are usually discreet, small areas, poor road location or construction could directly destroy or reduce unique communities and special features. Well-located roads may provide necessary access for monitoring and habitat improvements.

Economics (EC)

EC 1: How does the road system affect the agency's direct costs and revenues? What, if any, changes in the road system will increase net revenue to the agency by reducing cost, increasing revenue, or both?

Refer to Report Section, tab 1 in TAP spreadsheet.

EC 2: How does the road system affect the priced and non-priced consequences included in economic efficiency analysis used to assess net benefits to society?

The management of the road system involves decisions to build new roads, reconstruct roads, perform maintenance on some roads and not others, decommission roads, or temporarily close them if they are no longer needed or are causing resource damage.

Construction of new roads, although improving access to an area (a benefit to some), may diminish the desired natural and remote character associated with the area and would reduce its passive use value to some visitors.

Passive use values include features society values simply because they exist without actually using them or they expect them to be preserved for others to use and enjoy (a scenic landscape, wilderness, or an endangered plant or animal). They are also features valued for preservation (cultural resources and historic sites).

Decommissioning and/or closing roads may be necessary to meet budget and funding constraints or to prevent resource damage, but may diminish access to areas that are important to certain users of forest resources. People with a strong attachment to a place, activity, or road may consider it a loss in value unless they are willing and able to find, and adapt, to substitute experiences.

The road users that contribute the most significant economic benefits are those who visit the area for recreation-related activities such as:

- Driving for pleasure
- Camping
- Hunting - All open and seasonally opened roads provide access for hunting.
- Hiking/ Mountain Biking/Equestrian Use
- Special Events, such as long-distance trail rides
- Fishing
- Wildlife viewing - The open roads are used by visitors for this activity

Based on the activities that the road system accommodates, the following consequences are realized:

Priced:

- Sale of commodities such as timber, minerals, firewood
- Payments to states (counties)
- Less cost due to convenient access for research, inventory, and monitoring

- Road development and maintenance
- Liability, compliance with safety standards
- Maintenance of trails and recreation-related sites
- Fire suppression
- Resource management
- Control of invasive species
- Mitigation of resource damage from roads
- Law enforcement
- Special use permits, such as for utility corridors and communications sites

Non-priced:

- Resource protection on NFS lands as well as adjacent private lands from fire and non-native species infestations,
- Wildlife and watershed management to preserve the "passive" value that the public assigns to natural resources
- Access to public land and its resources
- Noise and air pollution
- Scenery
- Water quality
- Fish habitat, access for stocking
- Effect of road density on wildlife
- Litter

Typically, the road system increases the value of both priced and non-priced commodities, because without access these items have less value or cost more to obtain. The most notable exception to this is commodities that have an intrinsic value because they are difficult to access, such as a wilderness or remote area.

The type of experience society desires in the study area and its associated value depends in large part on whether or not there are roads, their density, their condition, and whether or not they are open to motor vehicle use. The consequence may be a net benefit or a cost depending on what value the public assigns to the type of experience they desire.

Road management activities that benefit some members of society by enhancing their quality of life, may negatively impact resources that other members value for their quality of life. These may include impacts to resources such as soil, water, habitat, scenic beauty, or a reduction in value that people assign to an area such as limited accessibility or solitude. Public input is needed to provide information to evaluate the tradeoffs being considered and will help assign "value" to non-priced consequences.

EC 3: How does the road system affect the distribution of benefits and costs among affected people?

The accessibility to resources in the study area is important to the local economy and commerce associated with forest visitors and has an economic influence on many counties. Since counties do not collect property taxes on federal land, activities that generate other tax revenue such as sales tax are beneficial to the community.

Forest roads are the primary means of access to forest resources. Changes to the road system and/or in road management can affect long-established access and use patterns, lifestyles, recreation activities, forest resource-related businesses, the collection of forest products, fire suppression, and the distribution of recreational opportunities available to users. These effects can change the distribution benefits and

costs for all users.

Construction, maintenance, or decommissioning of roads in the area is not likely to have a significant long-term impact on the economic benefits derived from recreation activities unless there is a significant reduction in the total mileage of roads that provide access for this use.

The road system distributes the following economic benefits to businesses of various sizes as well as individuals:

- Income from the sale of gas, food, lodging, supplies, and souvenirs.
- Employment under Government contracts for:
    - road maintenance
    - control of invasive species
    - vegetation management
    - trail maintenance
    - watershed management
    - fire suppression
    - maintenance of recreation sites

The road system creates different benefits and costs to people who use vehicles for travel within the area than to visitors who travel on foot or by other non-motorized methods. For those who choose non-motorized forms of transportation, the economics of the road system may cost more in terms of aesthetic values, air and noise pollution, and conflicts with motorized vehicle use.

Reduced road mileage and/or maintenance can lead to unbalanced recreation opportunities among users and directly affect the distribution of economic benefits and costs to the region. Closing roads would limit or eliminate access to those who are unable or unwilling to walk long distances, which can have greater impacts as the population ages. Census projections indicate that nearly 1 in 5 Virginians will be 65 or older by 2030. Reduced access could increase the cost of resource removal, which usually requires mechanized equipment. This could have economic impacts for the local communities, which may depend on convenient access for employment opportunities.

In contrast, improved road access can increase the efficiency and effectiveness of fire-suppression activities, but can also contribute to an increase in the number of human-caused fires in the area. Closing or restricting roads to minimize traffic could be a benefit by reducing fires and keeping the road in a condition that facilitates use by firefighting equipment.

State roads between communities affect how the benefits and costs associated with use of the area are distributed beyond the immediate communities. The GWNF is often located on long ridges and higher elevations, with private lands adjacent in the valleys and lower elevations. A number of Forest roads serve as local connector routes for commuters, school bus routes and emergency services. Closure of some roads could greatly increase local travel needs.

Commodity Production - Timber management (TM)

TM 1: How does the road spacing and location affect logging system feasibility? How does the road system affect managing the suitable timber base and other lands?

Much of the transportation network has been built for and through timber sales so the system serves the timber resource well. Planning has considered future needs as well as immediate sale needs. A few large blocks of land suitable for timber production is not currently roaded, but collector road access is generally adequate. Timber sales may require the opening of closed system roads, construction of temporary roads

and construction of very limited mileage of permanent roads to extend access to some areas suitable for timber production.

TM 2: How does the road system affect managing the suitable timber base and other lands?

See TM1

TM 3: How does the road system affect access to timber stands needing silvicultural treatment?

See TM 2.

Commodity Production - Minerals Management (MM)

MM 1: How does the road system affect access to locatable, leasable, and salable minerals?

Only about 12,000 acres of the GWNF are currently under lease for gas and oil. If gas deposits are found to be commercially feasible for development, additional roads will likely be needed for exploration and development. The road system is the only means of access for public use of salable minerals (mineral materials). The Forest has acquired lands status, and so, locatable mineral laws do not apply on the Forest.

Commodity Production - Range Management (RM)

RM 1: How does the road system affect access to range allotments?

The existing road system adequately provides access to the current range allotments.

Commodity Production - Water Production (WP)

WP 1-3: How does the road system affect access, constructing, maintaining, monitoring, and operating water diversions, impoundments, and distribution canals or pipes, municipal watersheds, or hydroelectric projects?

Several Forest roads are used to access the Bath County pumped storage project on the Warm Springs Ranger District. These roads are managed under a long term special use permit.

Commodity Production - Special Forest Products (SP)

SP 1: How does the road system affect access for collecting special forest products*?*

Firewood is the main special forest product collected on the GWNF. The road system adequately meets the needs of firewood collection.

Special Use Permits (SU)

SU 1: How does the road system affect managing special-use permit sites (concessionaires, communications sites, utility corridors, and so on)?

About 50 miles of the current road system are necessary for managing special use sites and meeting the special use needs are the primary purpose of these roads.

General Public Transportation (GT)

GT 1: How does the road system connect to public roads and provide primary access to communities?

Primary accesses into and out of the GWNF is provided by State or Federal Highways. These roads are open year-round and designed for both passenger cars and trucks. These roads connect to arterial, collector, and some local Forest Service roads, where traffic is dispersed in the Forest for a variety of uses. Some county roads and state highways traverse into or through the National Forest. There is much interspersed private and federal land ownership, so many National Forest roads provide access to and from private lands.

GT 2: How does the road system connect large blocks of land in other ownership to public roads?

There is much interspersed private and federal land ownership, so many National Forest roads provide access to and from private lands. About 100 miles of the current road system provide this type of access and are being considered for designation as Forest Highways.

GT 3: How does the road system affect managing roads with shared ownership or with limited jurisdiction? (RS2477, cost share, prescriptive rights, FLPMA easements, FRTA easements, DOT easements)

Rights of access by law, reciprocal rights, or easements are recorded in Forest files and county courthouse documents. The Forest recognizes these rights and works with the owners to preserve access while protecting the natural resources and facilities on adjacent National Forest Lands.

GT 4: How does the road system address the safety of road users?

Road System: In 1975, the Forest Service developed a Memorandum of Understanding with the Federal Highway Administration that required the Forest Service to apply the requirements of the National Highway safety program, established by the Highway Safety Act, to all roads open to public travel. In 1982, this agreement was modified to define "open to public travel" as "those roads passable by four-wheeled standard passenger cars and open to general public use without restrictive gates, prohibitive signs…" Most roads maintained at level 3, and 4 meet this definition. Design, maintenance, and traffic control on these roads emphasize user safety.

The largest proportions of road maintenance and improvement funds allocated to the Forest are spent on reporting and general health for these higher standard roads. Safety work such as surface maintenance, roadside clearing and installation and maintenance of warning and regulatory signs are performed on an annual basis. Traffic control signing follows standards set forth in the Manual on Uniform Traffic Control Devices (MUTCD).

Administrative Uses (AU)

AU 1: How does the road system affect access needed for research, inventory, and monitoring?

People interested in conducting research, inventory, and monitoring on the GWNF have not identified access as an issue. Research has been performed on the forest in the past and we have received no negative comments related to our road system due to it. The Forest Service system provides adequate access for research, inventory, and monitoring.

AU 2: How does the road system affect investigative or enforcement activities?

Unlawful activities are often centered on roads. Illegal use of closed roads, unlawful collection of forest

products, mud bogging, drug use/manufacturing and the dumping of trash along roads are just a few of these activities. The same open and closed roads that provide access for these illegal activities are the roads that provide access for law enforcement to investigate these activities.

The road system provides access to the George Washington and Jefferson National Forests for a variety of purposes. As long as there is access to the forest, illegal activities can occur.

Protection (PT)

PT 1: How does the road system affect fuels managements?

Roads are a key element in planning and implementing a fuels management program. Roads provide critical access for fuels management activities (prescribed burning). Existing roads are used as control features on many of the prescribed burns that are implemented on the Forest. Roads are preferred control features because they allow lines to be easily patrolled, rapid response to spot fires, and minimal ground disturbance is required. The current forest road system has been adequate to meet the needs of the fuels management program. It has not been necessary to consider construction of a road strictly for fuels management.

In general, decommissioning roads will restrict access during prescribed burns. Limited access will lead to increased response times. In the absence of an existing road, dozer lines are used. However, using these types of lines will require the need for additional ground disturbing activities to create an adequate control line. Most roads serve as an additional control feature that allows managers more flexibility for contingency planning for burn units. Decommissioning roads could also increase the size of escapes due to limited patrolling opportunities and the limited ability to respond to spot fires with fire suppression equipment.

PT 2: How does the road system affect the capacity of the Forest Service and cooperators to suppress wildfires?

The current road system has not presented any problems in the Forests' ability to suppress wildfires. There have not been any critical areas identified that need roads specifically for wildfire suppression purposes. The forest continues to utilize all roads to the fullest extent possible during wildfire suppression efforts.

In general, decommissioning roads will restrict access of wildfire personnel and equipment. These restrictions may lead to increased fire size and a heightened probability that severe resource damage may occur. Most roads serve as excellent control features as well as escape routes for firefighting personnel. Conversely, road construction may increase accessibility of wildfire personnel and equipment, limit fire size, and provide additional safety during wildfire suppression.

Roads are often used as firebreaks and control lines for wildfire control. Using roads as firebreaks can be a particularly effective, efficient and low cost method of addressing the issues of wildfire hazards, and in the management of fuels. Most roads are adequate for firefighting equipment to travel on. Closed and gated classified roads may need minimal dozer work to be utilized for equipment movement.

PT 3: How does the road system affect risk to firefighters and to public safety?

Roads serve two main functions during wildfire suppression efforts. First, they serve as access routes to the fire. Second, they serve as excellent escape routes for firefighters as well as the public. In the wildland/urban interface (WUI), roads should be designed, or upgraded, to allow for the access and egress

of larger protection equipment. Most forest roads are able to accommodate tandem axle dozer transports as well as smaller, brush-type engines used by the Districts. Roads can greatly increase the safety of firefighters. Roads can also be used by arsonists to set fires. Higher standard roads may also increase the risk of firefighter/public conflict due to increased volumes of traffic.

Recreation – Unroaded Recreation (UR) and Roaded Recreation (RR)

UR 1: Is there now or will there be in the future excess supply or excess demand for roaded or unroaded recreation opportunities?

Recreation supply and demand is discussed in Chapter 3 of the Draft Environmental Impact Statement (DEIS) for the Draft Revised Land and Resource Plan of the GWNF.

Public land ownership is interspersed in large tracts of privately-owned and inhabited land. There are a number of miles of country roads throughout the area. Visitors using forest roads are often hunters, hikers, bikers, and people driving the backcountry for pleasure. Visitors are generally a local audience traveling near their "back yards," a few miles from their property. The remote nature of the public lands in the area, with few or a moderate number of forest roads provides a sense of remoteness and solitude for people in vehicles. Users enjoy roaded access to their National Forest and any road closures are met with opposition from those that use the road. The GWNF is currently well roaded and provides many opportunities to those who enjoy roaded access.

The current level of wilderness, remote backcountry (remote highlands), the National Scenic Areas and other unroaded areas appear to provide an adequate amount of unroaded recreation opportunities.

The increase in development on adjacent private lands will increase the demand for all types of recreation on the GWNF, including roaded and unroaded recreation.

UR 2: Is developing new roads into unroaded areas, decommissioning of existing roads, or changing the maintenance of existing roads causing substantial changes in the quantity, quality, or type of recreation opportunities?

Depending on the extent that new roads penetrate into the interior of unroaded areas, new road construction could cause changes in the quantity or quality of unroaded recreation. However, new road construction around the perimeter of unroaded areas would not cause any substantial change in the quality, quantity or type of unroaded recreation opportunities. o Additional decommissioning could enhance some of these unroaded recreation opportunities. Changing maintenance levels will not substantially cause a change in quantity, quality or type of recreation opportunities, however it could result in a change in the number of visitors engaging in recreation opportunities on the national forest. Increased maintenance levels may result in increased visitation; decreased maintenance levels may result in decreased visitiation, particularly to front-country destinations such as developed recreation sites where easy access is anticipated and expected.

UR 3: What are the adverse effects of noise and other disturbances caused by developing, using, and maintaining roads on the quantity, quality, and type of unroaded recreation opportunities?

Road development and the sounds of passing vehicles diminish the sense of solitude and remoteness of an area, but provides for more access into more areas of the Forest.

UR 4: Who participates in unroaded and roaded recreation in the areas affected by constructing, maintaining, and decommissioning roads?

All of the Forest users participate and nearly all enjoy some level of both roaded and unroaded recreation. New road construction is very limited on the GWNF and does not generally affect the major unroaded areas on the Forest.

UR 5: What are these participants' attachments to the area, how strong are their feelings, and are alternative opportunities and locations available?

Attachment to the main unroaded areas of the GWNF is high among a number of user groups. Alternative unroaded opportunities are available on the Jefferson National Forest, Monongahela National Forest, and Shenandoah National Park. However, of the three, the GWNF is the largest provider of unroaded recreation opportunities. Attachment to roaded areas is also high. There are many alternative locations for roaded recreation opportunities including nearby national forests, national parks, Virginia and West Virginia state parks, and parks and greenways provided by cities and counties.

Passive Value (PV)

PV 1: Do areas planned for road constructing, closure, or decommissioning have unique physical or biological characteristics, such as unique features and threatened or endangered species?

Any project proposing road construction, closure or decommissioning is subject to environmental analysis for effects to unique, physical or biological characteristics, such as unique features and threatened, endangered and sensitive species. This analysis will be conducted at the project level.

PV 2: Do areas planned for road construction, closure, or decommissioning have unique cultural, traditional, symbolic, sacred, spiritual, or religious significance?

The issues of cultural, traditional, symbolic, sacred, spiritual or religious significance have not been common on road construction projects, except in a general context. Any project proposing road construction, closure or decommissioning is subject to analysis for effects to cultural resources. This analysis will be conducted at the project level.

PV 3: What, if any, groups of people (ethnic groups, subcultures, and so on) hold cultural, symbolic, spiritual, sacred, traditional, or religious values for area planned for road entry or road closure?

See PV2

Social Issues (SI)

SI 1: What are people's perceived needs and values for roads? How does road management affect people's dependence on, need for, and desire for roads?

Many people view roads as beneficial to their experience and to forest management.Roads are used to transport goods and people and access recreation and commercial opportunities. Well-maintained roads facilitate recreation and other experiences; poorly maintained roads make these experiences unpleasant, difficult, or impossible. During the Fiscal Year 2006 National Visitor Use Monitoring project, over 90% of recreation visitors to the George Washington and Jefferson National Forests who completed a satisfaction survey indicated that national forest roads were either very important or important to them.

However, roads are not always viewed as beneficial. Many people feel that the National Forests have too many roads and that no new road construction is necessary.

SI 2: What are people's perceived needs and values for access? How does road management affect people's dependence on, need for, and desire for access?

People's needs and values for access are diverse. It ranges from people who want to be able to access all areas of the National Forest on motorized vehicles to people who want limited access due to a desire for solitude or concerns about environmental impacts as well as those who are dependent on forest access for their livelihoods. Access to developed sites, residences, and commercial sites is important to many who use the forest transportation system.

Recreation access has been a controversial issue. While nearly all people use a motor vehicle to access the National Forest, the extent of the access can be an emotional issue. For people who want a non-motorized experience while immersed in the environment for hiking, mountain biking, horseback riding, or birding, motor vehicles can be an intrusion. For people who choose to experience the forest through motorized recreation, increased access improves their experience by providing a range of opportunities and challenges.

SI 3: How does the road system affect access to paleontological, archaeological, and historical sites?

Roads give greater access to these sites and as a result, can provide opportunities for studying, learning about, and enjoying our natural history and cultural heritage. However, this greater access and the probable increased visitation can make sites more susceptible to unintentional physical damage and intentional looting and vandalism.

SI 4: How does the road system affect cultural and traditional uses (such as plant gathering, and access to traditional and cultural sites) and American Indian treaty rights?

This has not been a significant issue on the GWNF.

SI 5: How are roads that constitute historic sites affected by road management?

This has not been a significant issue on the GWNF.

SI 6: How is community social and economic health affected by road management (for example, lifestyles, businesses, tourism industry, infrastructure maintenance)?

The road system provides access to forest lands for recreation and tourism. It provides access for infrastructure maintenance and contract implementation. Community social and economic health is directly affected by road management decisions on the national forest in varying degrees. Many local citizens use national forest roads for commuting as well as to enjoy the recreation opportunities provided by the national forest. Local communities recognize the importance of the GWNF in their comprehensive plans, which recognize the recreation and tourism benefits of the Forest. These benefits include both the roaded and unroaded opportunities. The Highlands Scenic Tour is a component of the Forest Service National Scenic Byways system. It was established to enhance tourism and interpret the scenic, historic and natural resources of the area.

SI 7: What is the perceived social and economic dependency of a community on an unroaded area versus the value of that unroaded area for its intrinsic existence and symbolic values?

No local communities have identified a dependency on any particular unroaded or roaded areas.

SI 8: How does road management affect wilderness attributes, including natural integrity, natural appearance, opportunities for solitude, and opportunities for primitive recreation?

Road management does not affect wilderness attributes since there are no roads in wilderness areas. If any road construction is proposed in Potential Wilderness Areas, the effects on wilderness character would be evaluated.

SI 9: What are traditional uses of animal and plant species in the area of analysis?

The primary use of animal and plant species is for viewing and hunting.

SI 10: How does road management affect people's sense of place?

"Sense of place" is linked to many different factors that invoke a special feeling or attachment to a certain area. An area's vegetation, views, solitude and recreation or commercial opportunities, among other things, may all contribute to this "sense of place".

In some cases, the road itself facilitates a person's enjoyment of the area by providing a pleasurable driving experience and encouraging a certain type and amount of use. Altering road systems or a decline in road maintenance can disrupt or change long-established patterns of access and use and may result in not meeting visitor expectations. Conversely, some people's "sense of place" is dependent on there being no or limited access to some areas. Building roads in such areas will change the setting, and probably, destroy the "sense of place" of some individuals or user groups.

Civil Rights and Environmental Justice (CR)

CR 1: How does the road system, or its management, affect certain groups of people (minority, ethnic, cultural, racial, disabled, and low-income groups)?

The road system is used by all groups of people. Changes in road management, including closing or decommissioning of any of the roads, would generally have the same effect on minorities, ethnic, cultural, racial groups of people. The disabled could have less access to the National Forest due to road closing and decommissioning. There may be some low-income groups that use the National Forest road system to access gathering, fishing, hunting areas that would be adversely affected by road closure, or decommissioning. These needs need to be further evaluated in project scale analysis.